Section D. Standard Towing Procedures

Overview

Introduction

The procedures listed below are derived from time-tested, experience-based techniques proven to be effective, safe, and efficient. They shall be real actions, performed by coxswain and crew. Some of the actions can be executed at the same time to minimize duplication or avoid wasting time, but be sure to indicate that an action has been taken. In extreme conditions or emergencies, some actions may not be possible. If actions must be skipped, make sure to consider this in assessing and managing risk. If a problem occurs at any step in the procedures, it may be safer and easier to "back up" to the last successfully completed step and restart.

In this section

These items are discussed in this section:

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Pre-Towing Procedures

D.1. General

The amount of effort put into preparing ahead of time will pay off with safer, easier execution of the tow.

NOTE

Throughout the entire towing evolution, open communication among the coxswain and crew is absolutely necessary for safety.

D.2. Receive notification and accept tasking

When notified of a potential towing mission, get as much information needed to do the job effectively. Write down critical information, and confirm what you have written.

- Get as much critical information as necessary.
- Write down the information.
- Develop a full understanding of the situation.
- Make a conscious decision to "accept" the tasking.

Make this a common practice. The coxswain is ultimately responsible for mission execution, so confirm the tasking in view of vessel and crew capability. If tasking exceeds vessel or crew capability, particularly if not an actual distress case, be assertive and describe your concerns. Consider vessel towing limits, maximum range, sea-keeping, crew fatigue, etc. Assess and manage potential risk.

NOTE

Keep a brief (plastic clipboard and grease pencil) written record of critical information. Include vessel information number of persons on the boat, position, and environmental conditions. A written record allows the crew to concentrate on task completion without having to later rely on memory for needed facts. Repeating information over the radio is frustrating and distracting. As information changes, update the record.

D.3. Brief the crew

Conduct a thorough boat crew briefing. Explain the situation and what might be expected. Use the facts. If there is any confusion or uncertainty, clear it up now. The crew must participate and ask relevant questions. Assign personnel to assist with preparations and collect any needed tow rig or assistance items not aboard the towing vessel. Ensure proper safety and personnel protective equipment is donned by the crew.

D.4. Evaluate conditions

Note how the different environmental conditions will affect the operation. As conditions may likely change during the mission, estimate which phase of the mission will encounter which conditions and whether on-scene conditions will be different from those en-route. Keep a record of the present and forecast conditions (do not try to rely on memory) and update as necessary. Necessary condition information:

- Existing and forecast marine weather (including winds, seas, bar conditions).
- Currents and tide (next high/low, slack/maximum).
- Daylight/Darkness (sunrise/sunset, twilight).

D.5. Operate and navigate the vessel safely

The only way to perform the tow is get there safely. **Do not let a sense of urgency affect judgment.** Safe operation and navigation:

- Maintain safe speed for the conditions (seas, visibility, and other traffic).
- Keep constant awareness of navigational position and navigational hazards.
- Stay aware of the distressed vessel's position.

D.6. Communicate with distressed vessel

Make radio contact with the distressed vessel, if possible. Communication procedures:

- Provide the distressed vessel your estimated time of arrival.
- Advise persons on the distressed vessel to put on PFDs.
- Get details of deck layout and fittings. Ask about the size of chocks and cleats to determine size of towline, bridle or drogue line and bridle.
- Ask for information the distressed vessel's crew may think you will need to know before arriving on scene (lines or gear in the water, nearby vessels, etc.).
- Determine if anything has changed since the distressed vessel's initial contact with the operational commander.
- Ascertain any sense of heightened urgency.
- Inform the distressed vessel that once on scene, you will observe conditions and make final preparations before setting up the tow and will provide further instructions then.

- Establish and maintain a communications schedule.

D.7. Prepare equipment

With the information known, begin to plan a tow rig. Ready all necessary equipment and re-inspect it, i.e., towline, bridle, shackles, knife, messenger line, chafing gear, etc., as directed by the coxswain.

D.8. Perform an on-scene assessment

Once on scene, use the following procedures:

- Watch the vessel's movement (pitch, roll) in the seas and determine the effect of wind and current on the distressed vessel's drift rate and lateral movement. Compare it to your own drift. Knowing the different drift rates will help determine the best approach.
- Evaluate the location and any abnormal condition of deck fittings.
- Confirm the number of persons on board.
- Note any unusual conditions that may affect towing procedures, i.e., loose gear, rigging, or debris in the water.
- Communicate any concerns to the distressed vessel and direct all personnel on the distressed vessel to put on PFDs.
- Decide whether to put one of your crew aboard the distressed vessel.
- Decide if it is best to remove the crew from the distressed vessel.
- Determine if an equipment transfer (drogue, pump, radio) will be necessary.
- After evaluating the on-scene situation and making risk assessment, decide whether to tow or not.

NOTE

This period of pre-tow, on-scene analysis is when crew experience and judgment on both vessels must mesh. Discuss concerns before directing action. The distressed vessel's crew may have information that you do not. The easiest way to get the big picture may be by circling the distressed vessel, if possible.

A method to check drift rate of the distressed vessel is to maneuver the towing vessel onto the same heading as the distressed vessel and stop astern of it. If the distance between the vessels increases, one vessel has a higher drift rate.

Note the different angles or aspects the towing vessel and the towed vessel hold towards the winds and seas. The only time the drift rate and aspect will be exactly the same is if the vessels are exactly the same.

D.9. Make-up the tow rig and prepare for transfer

Visualize the tow in progress, given all the factors identified in the on scene assessment. This may help identify any special considerations. Appropriately size elements of the tow rig for the specific distressed vessel, i.e., a 3-inch towline with eye might not fit through a bow chock or around a cleat of a 25-foot boat.

NOTE

Pass equipment (pump, drogue, etc.) and transfer personnel before making the approach to transfer the tow rig.

- Set up the tow vessel deck with all equipment staged and ready.
- Attach 2 heaving lines to the tow rig. If using a bridle, secure one heaving line to one eye (or end) and the second to the other eye (end).
- Assign crew members to each heaving line, and to bitt or line handler duties.

D.10. Determine the approach

Though optimal to make your approach from down wind and down sea, the drift and aspect of the distressed vessel may determine the approach. A vessel with a large superstructure forward, will tend to lay stern-to the wind. (Many outboard-powered vessels exhibit this tendency to "weathervane.") A vessel with deep draft and low superstructure will generally lie broadside to the seas. Of course, there are any number of positions in between. The approach to a vessel drifting down wind and down sea, "stern to" the wind and seas will be different from the approach to a vessel lying "beam to." The usual approach by a boat to make a tow is with the bow into the seas.

Determine how you will make the approach and inform your crew. Specifically tell the crew from which side to pass the tow rig (or equipment), when (in what relative position of the two vessels) to pass the tow rig, and whether to use a heaving line.

D.11. Brief the distressed vessel

Explain your plans and pass safety instructions. Include enough information so the distressed vessel's crew does not have to ask questions once the approach begins. Follow these steps when briefing the distressed vessel:

- If transferring crew or equipment before the tow, relate when and how.
- Describe the towing approach.
- Tell when and how you will pass the tow rig.
- Give tow rig connection instructions (how to lead, where to attach).

- List emergency break away procedures.
- Describe emergency signals.
- Instruct on general safety during the approach and passing the tow rig.

NOTE

Limit the content of this briefing to information the distressed vessel needs to know before the tow begins. Once hooked up and in tow, there will be opportunity to pass additional information.

Towing Astern

D.12. General

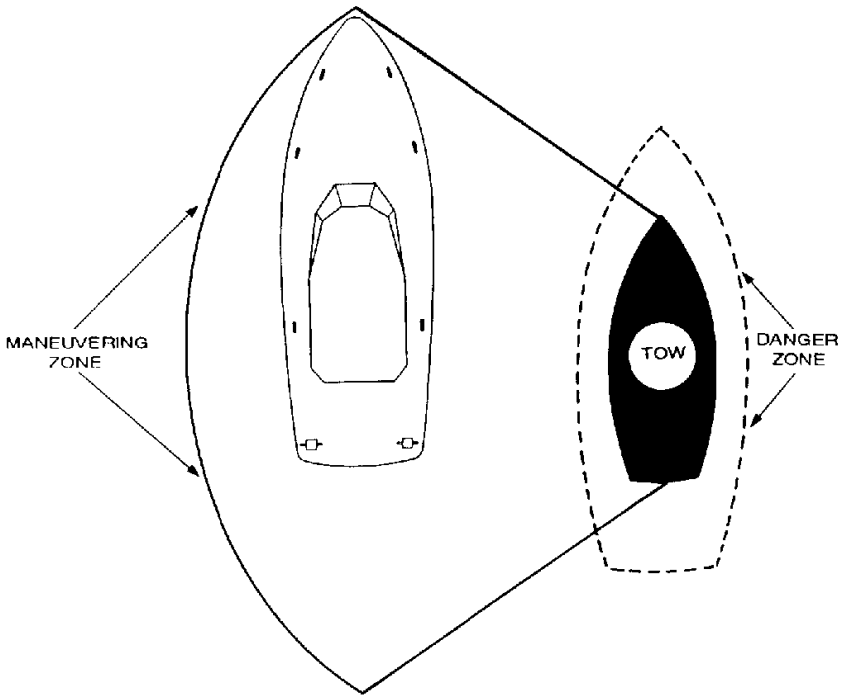
The most common towing technique is to tow the distressed vessel from astern of the rescue vessel.

D.13. Making the approach

The on scene assessment gives you the knowledge of how conditions affect both vessels. Knowledge and experience with the towing vessel's handling and maneuvering should allow you to overcome conditions and put the towing vessel in a safe position for the crew to pass the tow rig.

D.14. Establish a danger zone

Before starting the approach, establish an imaginary danger zone around the distressed vessel and approach outside of it. The size of a danger zone depends upon conditions and the arrangement of the distressed vessel. The poorer the conditions, the larger the danger zone.



Danger Zone
Figure 17-10

D.15. Maneuver to an optimum position

Maneuver the towing vessel so the crew can maximize use of the best deck work area on the vessel for passing and working the tow rig. This will provide the opportunity for the most vessel control and visibility for the coxswain, while keeping a safe distance from the distressed vessel, and providing a safe "escape route" in case of emergency. This is the **optimum position**.

CAUTION !

The coxswain must let crew members know before making correcting maneuvers so that they can tend lines and ready themselves.

- In calm conditions, make the approach at an angle that allows the crew the best opportunity to pass the tow rig.
  - In rough conditions make your approach into the prevailing wind and seas. If the wind is different from the seas, make your approach into the seas. This usually maximizes control for the coxswain and ensures the most stable platform for the crew.
  - Make the approach at the slowest speed necessary to maintain steerage.
- Once in the optimum position, **keep station** on the distressed vessel. Station keeping maintains the position and heading relative to the weather and seas, outside the danger zone. This is usually done by use of helm and engine control. To keep station, the coxswain must simultaneously focus on the seas, the bitt and line handlers, and the position with respect to the distressed vessel. Maneuver and apply power early and smoothly as distance and angle to the distressed vessel change. If the towing vessel begins to move towards the danger zone, maneuver to open the distance. If the distressed vessel begins to get away from the towing vessel, close the gap. **Use correcting maneuvers (opening and closing) before a problem develops**. A small correction early can prevent a large problem later.

NOTE

Actual maneuvering techniques vary from vessel to vessel and are mastered by practice and experience. Actual station keeping techniques also vary as the specific wind and sea conditions affect the specific distressed vessel.

D.16. Keep station

The coxswain now must keep station, outside the danger zone and in a maneuvering zone (usually a 90 degree arc, from 45 degrees off the bow to 45 degrees off the stern, with the distance between vessels no greater than the length of the heaving line) for the crew to pass the tow rig. The coxswain must continue station keeping until the tow rig is connected and the transition to towing astern begins. The crew must make every effort to ensure that passing the tow rig goes smoothly and quickly.

CAUTION !

Maneuver as required but it is preferable not to make opening and closing maneuvers when lines are over (except the heaving line). Avoid making correcting maneuvers on the face of a wave.

NOTE

A boat crew's teamwork, communications, and experience are key to a safe, successful approach.

In calm conditions, station keeping may simply be holding the nearest safe position to take advantage of the best angle for the crew to pass the tow rig. However, even though conditions may be calm, a vessel's wake or a current can suddenly increase the chance of hull to hull contact with the distressed vessel. Plan a safe escape route for all approaches and while station keeping.

D.17. Pass the tow rig

Once maintaining optimum position, pass the tow rig.

- All lines, equipment, and connections should already be inspected, made ready, and double-checked.
- Minimize loose towline on deck by paying out directly from the reel. If the towing vessel is not equipped with a towline reel, fake the towline carefully so that it will not kink or tangle. In heavy weather, use caution to ensure line is not washed over the side and into the screw.

NOTE

While passing and connecting the tow rig, and transitioning to stern tow, use loud and clear communication between crew members and coxswain prevent accidents. Whenever the coxswain directs an action, a crew member must take that action and reply that the action has been taken. Whenever a crew member advises the coxswain of status or action, the coxswain must acknowledge same.

D.17.a. Calm conditions

Passing the rig in calm conditions (no heaving line):

- Coxswain directs crew to pass the rig.
- Line handler hands over or carefully tosses the end of the rig to a person on the distressed vessel. The person receiving the rig must be physically able to haul it to the connecting point and then attach it properly.
- Line handler advises coxswain that the rig is away.
- Line handler pays out and takes in towline as required to eliminate any risk of fouling the propellers, rudders, rigging, or other fixtures. Once again, advise the coxswain of the action successfully executed, and that the towline is properly secured on the towed vessel.

D.17.b. Using a heaving line

Passing a rig using a heaving line:

- Wet both heaving lines to make them more flexible and minimize risk of them becoming tangled.
- Take two-thirds of a heaving line coil into the casting hand leaving the remainder in the other hand.
- Check that the area is clear of people and obstructions.
- Advise coxswain when ready and await direction before casting.
- Coxswain directs cast.

NOTE

It takes practice to cast a heaving line properly. Adapt technique to conditions for a safe and successful result.

Call out "HEADS UP" as a warning to people on board the distressed vessel to take cover and watch out for the toss.

D.17.c. Casting

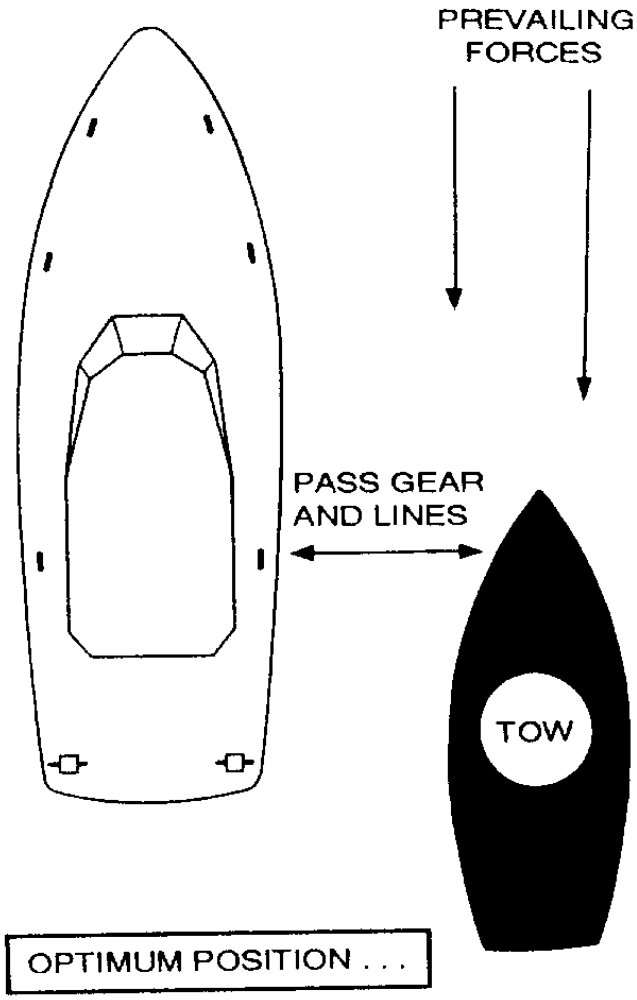
Casting a heaving line:

- Cast a heaving line so it falls across the distressed vessel's deck.
- Tell coxswain "heaving line cast," then that it's retrieved, short, or missed. Advise coxswain whenever a line is in the waters, so no maneuvering will be done.
- If the first cast is not retrieved, quickly recover the line and advise coxswain when the second heaving line is ready. When coxswain directs, repeat the procedure.
- Untie the unused/unretrieved heaving line from the tow rig (take care to untie the correct line) and advise the coxswain that you're ready to transfer the rig.
- Coxswain will direct to send the rig; crew replies and begins transferring the rig. Tend the messenger to reduce the risk of it becoming fouled. Once the rig starts across, maneuvering opportunities become very limited.
- Advise coxswain of tow rig transfer progress (when bridle is clear or aboard distressed vessel, when towline is going over or aboard, etc.).

D.18. Connect the tow rig

Methods of tow rig connection generally available are:

- Tow rig to fittings.
- Tow rig to trailer eye.



Optimum Position for passing the Tow Rig
Figure 17-11

Connecting Tow Rig to Fittings

D.19. General

The attachment point(s) for a tow rig must be sound. Towing places a tremendous strain on deck fittings, especially in rough conditions. On the distressed vessel, bow bitts, forward cleats and Samson posts will usually provide the best attachment points. Always use fittings secured to a deck with through bolts and backing plates or those secured to the keel or structural framing. Other fittings, such as pad eyes or capstans, may also provide solid attachment points.

CAUTION !

Though deck fittings should be checked during pre-tow procedures, do not hesitate to stop the connection if something is wrong. If necessary, recover the rig and transfer a crew member to the distressed vessel to physically inspect the fittings.

CAUTION !

Transfer of people between vessels is not a common practice. Whenever this is considered, it must be conducted with extreme caution for the safety of people on both vessels.

Unless the towing vessel puts a crew member aboard the distressed vessel, the towed vessel crew is responsible for these actions. A good brief to the distressed vessel will address each item, but in the rush to get things set up aboard the distressed vessel, the crew may forget important steps. The towing vessel crew must closely watch, and advise when necessary.

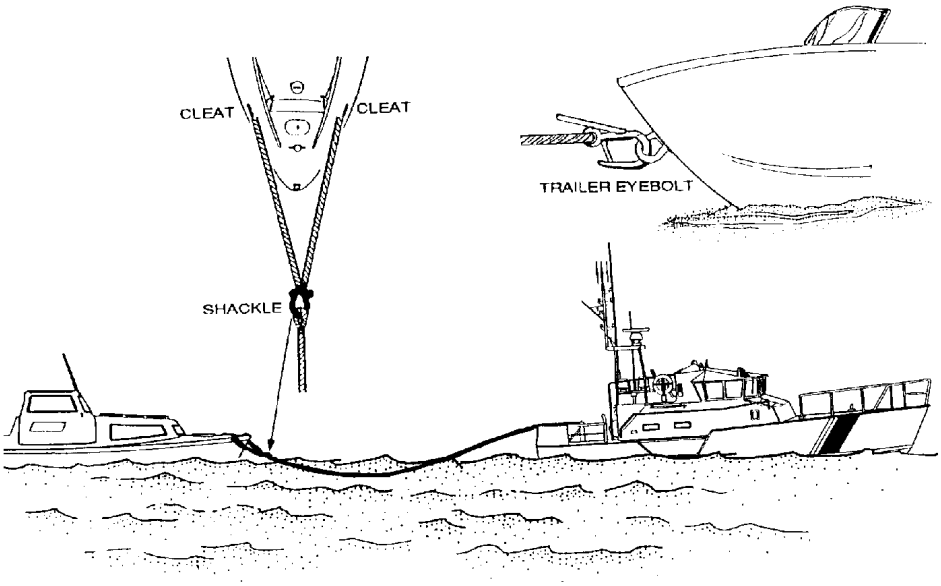
D.20. Ensure a fair lead

Lead a single point tow rig (pendant or towline) through or to a fitting as close to the center line as possible. Once led through a secure chock near centerline, the end of the rig can go to a suitable deck fitting (See Figure 17-12).

- Lead the parts of a bridle through chocks, equally spaced from the centerline.

CAUTION !

Avoid connecting the towline to an off-centerline fitting on the towed vessel. Use a bridle for an equal amount of strain on both sides of the bow.



Bridle and Single Point Tow Rig Connection
Figure 17-12

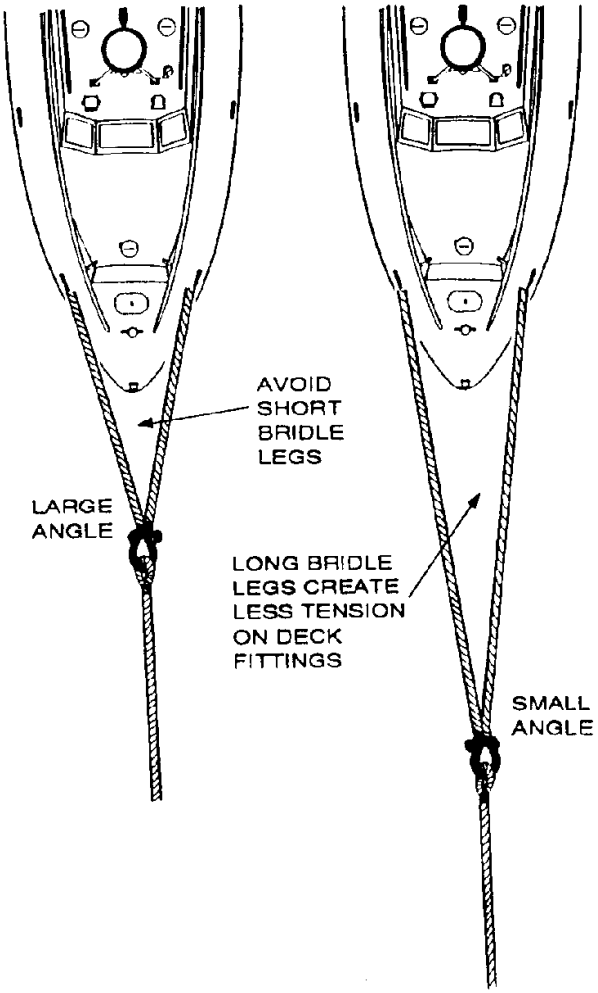
D.21. Make fast to fittings

Connect the eye of a pendant or towline to posts, bitts, or cleats so that it will not come loose when a strain is placed on the rig.

Connect the bridle to fittings located at points that allow equal pull to be exerted on them. Check that the center of the bridle is on centerline or the extension of the centerline. Minimize the angle made where the bridle joins the towline by using fittings as far forward as possible. (See Figure 17-13.)

D.22. Install chafing gear

Where necessary, try to protect the tow rig from abrasion or chafing, particularly if the rig takes a sharp turn at chocks or comes close to contact with any obstructions.



Towline Connection Showing Bridle Angle
Figure 17-13

Connecting Tow Rig to a Trailer Eye

D.23. General

On smaller, trailer-able boats, the trailer eye is frequently the sturdiest fitting available to attach a tow rig. Attaching a towline to the trailer eye is a dangerous technique. It requires the towing vessel to maneuver very close to a distressed boat and requires crew members to extend themselves over the side between two vessels, or under the flared bow sections of the distressed boat.

CAUTION !

To reduce risk in connecting the tow rig to the trailer eye, use a skiff hook.

D.24. Attach the skiff hook

A newer style of skiff hook with a quick release safety buckle and snap hook clip is in common use. Manufacturer instructions should be reviewed for its proper use. The older style skiff hook requires these steps:

- Connect the skiff hook pendant to the towline using a double becket bend or shackle.
- Slide the skiff hook into the boat hook handle.
- While keeping the pendant taut, extend the boat hook and snap the skiff hook into the trailer eye.

D.25. Hook up to the trailer eye

While keeping the pendant taut, extend the boat hook and snap the skiff hook into the trailer eye.

WARNING

Do not use a shackle to directly connect a towline to a trailer eye. This requires crew members to get too close under the bow of the distressed vessel.

Transition to Stern Tow

D.26. Start moving away

- Slowly move the towing vessel out of optimum position and the maneuvering zone.
- Give particular attention to the direction the towline tends and the amount of slack.
- Pay out towline gradually in conjunction with the towing vessel's movement.

CAUTION !

Do not put a working turn on the bitt until the rig is securely fastened to a tow AND persons on board are clear of the bow.

D.27. Put a working turn on the bitt

Once the towline is secured on the distressed vessel and persons on the towed vessel have cleared the bow, the coxswain instructs the crew member to take a working turn on the bitt. Different towing bitts require different types of working turns. Use a method to provide enough towline-to-bitt contact surface to ensure control of the towline. Smooth towline pay out keeps the towed vessel from being pulled around.

D.28. Maneuver to begin tow

Slowly maneuver to a position either in line with the towed vessel's centerline (to tow ahead) or perpendicular to the towed vessel's bow (to change the initial heading).

D.29. Maneuver to "pay out" course

Once the distance allows clear movement of a tow, maneuver the towing vessel to allow a smooth pay out of the towline. As tension increases in the tow line, static forces will be felt as the tow rig tries to move the towed vessel. Transitioning is the initial test of strength and performance for the tow rig and connections. Each towing vessel will react uniquely to this initial resistance. The pivot point distance, propulsion and steering, and size difference between towing and towed vessels and weather will determine how the towed vessel will react. Actual maneuvering techniques are mastered through practice and experience. Minimize surge and shock loading.

CAUTION !

Gradually come to a pay out course. Rapid movements or changes in direction increase the risk of:

- fouling the towline in propellers or on deck fittings
- shock loads
- loss of towline control

The bitt person must have complete control of the towline. Too much towing vessel headway may cause the bitt person to lose control of towline tension, and the towline will start to run.

WARNING

Crews risk injury from a running towline, with the possibilities of injuring their hands and arms in the tow bitt, tow reel, or in bights of line faked on deck. If the towline starts to run, reduce speed immediately. Regain towline control after the line stops running.

D.30. Pay out the tow line

Continue paying out towline until satisfied with the initial amount of towline scope.

D.31. Make up the bitt

- Once the desired scope of towline is deployed, the coxswain directs the crew to make up the bitt.
- Slow the forward motion enough to slack the towline, and then apply the proper turns.

WARNING

Do not attempt to make up the bitt with a strain on a towline. This increases risk of injury by catching hands, fingers, and arms between the bitt and the towline.

D.32. Set a towing watch

The towing watch has a critical responsibility. In addition to the crew member assigned, it is a collateral duty for all other crew members. The condition of the vessel in tow and the towline must be constantly monitored.

Underway With Stern Tow

D.33. General

The best course to safe haven is not always the shortest distance. Choose a course that gives the best ride for both vessels. At times, you may have to tack (run a zigzag type course) to maintain the best ride. Put into practice your understanding of the dynamic forces in towing to ensure a safe tow.

D.34. Brief the towed vessel

Pass instructions and information that will apply to each step of the tow astern.

- General safety (PFDs, staying clear of tow rig, tow rig chafe, location of crew).
- Equipment (pumps, drogues).
- Steering (whether to man helm or lock rudder amidships, whether to steer on towing vessel stern).
- Route you will take, expected weather and seas, destination, estimated time of arrival.
- Lighting, sound signals.
- Communications (primary/secondary radio frequencies, times of status reports).
- Emergencies (breakaways, signals).

D.35. Deploy drogue

If drogue deployment is necessary, i.e., to counteract a jammed rudder or other condition, deploy the drogue while barely making way before increasing speed to the planned towing speed. (See Section C, Towing Equipment, for procedure.)

D.36. Maintain a catenary

Once underway with a tow astern, maintain a proper length of towline As discussed in Section 17.B.4. (Combination of Forces and Shock-load), gravity causes a “dip” or downward sag to form in the middle of the towline as it is lengthened. This catenary acts as a natural shock absorber for a tow rig and is a major factor in counteracting shock-loading.

D.37. Stay in step

Keep the tow in step at a proper distance behind the towing vessel. When the towing vessel is on a wave crest, the towed vessel should also be on a wave crest 2 to 3 waves behind.

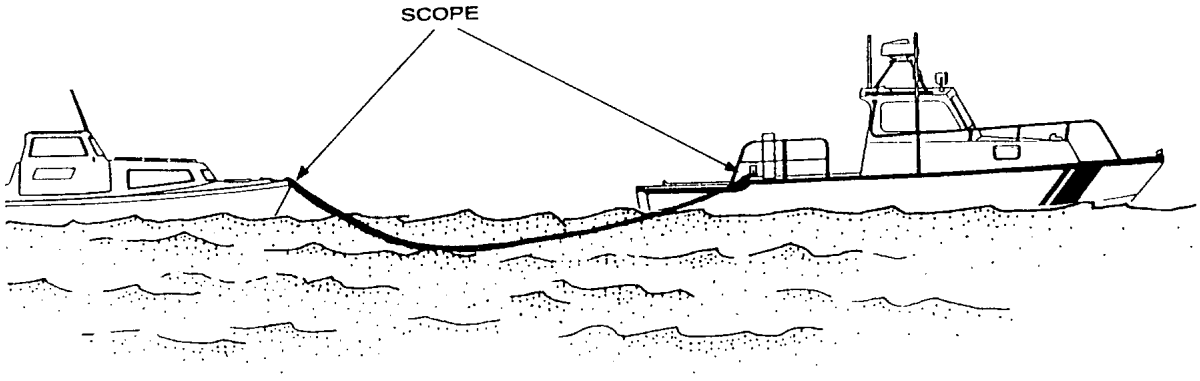
If the towing vessel is riding up a crest while the tow is sliding down a crest, the towline slackens. Control of the tow may be lost. If an adjustment is not made, when the towing vessel starts to slide down the crest into the trough as the towed vessel starts to climb a crest, the towline becomes taut, shock-loading the tow rig.

- Increase towline scope to get the tow on crest at the same time as the towing vessel.
- Careful increase or decrease of power to vary towing vessel speed may also help.

Other measures that may help to stay in step include:

- Alter course to increase the angle of the tow to the waves (to approximately 45 degrees).
- Deploy a drogue. In really confused seas, drogue deployment could help by preventing the towed vessel from surfing down the face of a wave.

Sometimes conditions make staying in step impossible. In such cases, use the techniques above and reduce speed to counteract shock loading.



Scope of Towline with Catenary
Figure 17-14

D.38. Minimize yaw

The tow is said to yaw when it veers to one side or the other. Yaw can be caused by trim (including list, heeling or rolling, or by a bow-down attitude), rudder problems and wave action. Severe yawing is extremely dangerous and if not corrected, may cause one or both vessels to capsize. Yawing also places tremendous strain on deck fittings and connections. Ways to reduce or minimize towed vessel yaw include:

- Change towline scope.
- Adjust trim (more easily done on a smaller vessel) to raise the bow or counteract list.
- Decrease speed or alter course to reduce effect of waves and wind.
- Deploy a drogue (particularly to overcome rudder problems).

Keep close watch on the action of the tow and immediately report any unusual movements to the coxswain. If yawing cannot be reduced or controlled, it may be prudent to heave to until sea conditions improve or the source of the yaw is corrected.

NOTE

Currents can cause a relatively constant or gradual offset of the towed vessel from the towing vessel's intended track or heading. Do not mistake this for yaw. (See "Compensating for Current," below.)

D.39. Tow at a safe speed

A safe and comfortable towing speed maximizes towing efficiency. Damage, sinkings and loss of life have occurred as a direct result of towing too fast. Maximum safe towing speed is based on the vessel's waterline length and hull shape, but wind and sea conditions could dictate a much slower speed. The following formula shows how to calculate maximum safe towing speed.

- Towing Speed Formula. For the purposes of the following calculations:

  S = Maximum towing speed (hull design speed)

  Ss = Maximum Safe towing speed

  Lw = Square Root of Length at waterline

  S = 1.34 x Lw

  Ss = S - (10% x S) a 10% reduction in the maximum towing speed.

For example, to determine a safe towing speed for a boat that has a 36-foot waterline length, do the following:

S = 1.34 x Lw
S = 1.34 x (square root of 36)
S = 1.34 x 6
S = 8.0 knots
Ss = 8.0 - (.1 x 8.0)
Ss = 8.0 - .8
Ss = 7.2 knots

Figure 17-15 shows calculated safe towing speeds based on waterline length.

WARNING

Due to safety concerns, never try to tow a hull faster than the hull design speed. Above hull speed, the vessel will try to ride up on its bow wave, becoming unstable and, in extreme cases, could possibly capsize. Also, wave drag (even one large wake) could slow the hull to displacement speed and cause a severe shock-load in the tow rig as the towing force tries to pull the towed vessel back on plane. In response to this shock-load, the towed vessel could plow its bow into another wave and swamp or capsize.

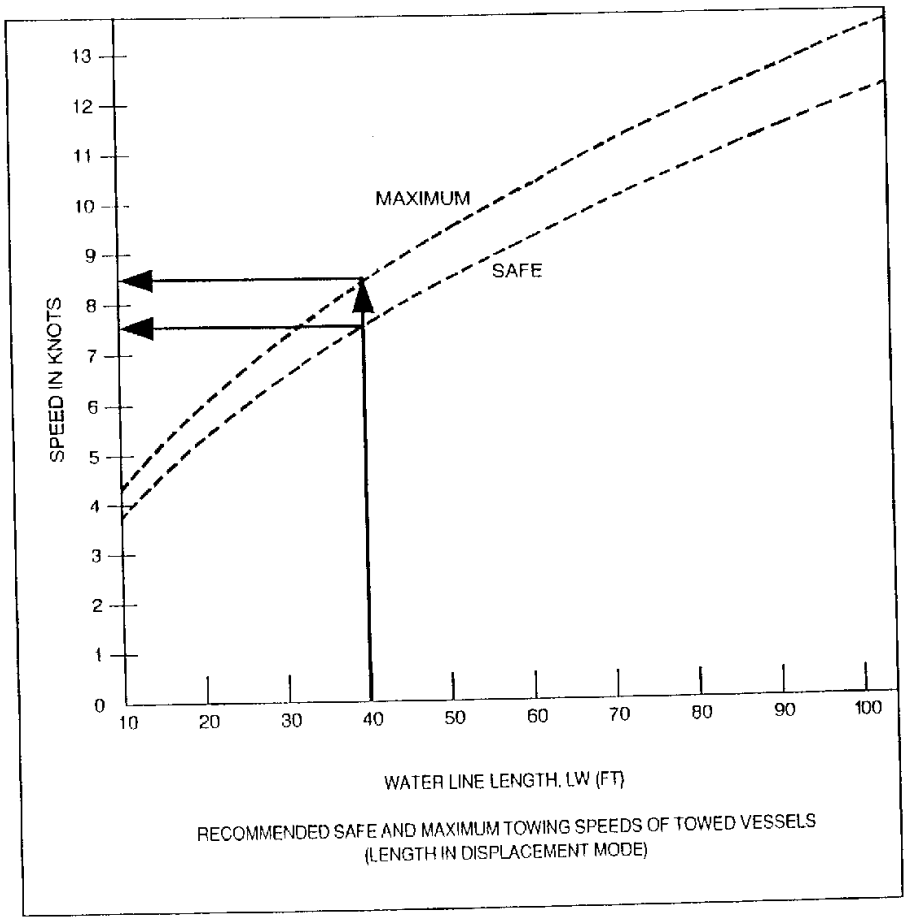
If it is possible to tow fast enough to get the vessel up to hull design speed, you can reduce the strain and stress of the tow for both vessels. Often, due to weather, seas, and other conditions, you will not be able to tow a hull fast enough to take advantage of its design. Table 17-1 are the recommended maximum safe speeds for all vessels.

CAUTION !

Do not overlook the effects of wind and seas on determining safe towing speed. Though conditions can change during a long tow, be particularly careful when transition takes place in relatively protected waters. What may have been a safe speed during transition before could become dangerous for the towed vessel once it gets out of the lee of a headland, wharf, or large vessel.

MAXIMUM TOWING SPEEDS

DISPLACEMENT AND PLANING HULL VESSEL TOWING SPEEDS					
VESSELS WATERLINE LENGTH	SQUARE ROOT	MAXIMUM TOWING SPEED	VESSELS WATERLINE LENGTH	SQUARE ROOT	MAXIMUM TOWING SPEED
20	4.5	6 KNOTS	70	8.4	11.3 KNOTS
25	5.0	6.7	75	8.7	11.7
30	5.5	7.4	80	9.0	12.0
35	6.0	8.0	85	9.2	12.3
40	6.3	8.4	90	9.5	13.0
45	7.0	9.4	95	9.8	13.1
50	7.1	9.5	100	10.0	13.4
55	7.4	9.9	105	10.3	13.8
60	7.8	10.5	110	10.5	14.1
65	8.1	10.8	115	11.0	14.7



Calculated Safe Towing Speeds
Figure 17-15

Compensating for Current

D.40. General

Handling a tow becomes more of a challenge when traveling in a river, estuary or other area where tidal currents affect navigation or in areas where major coastal currents or wind-driven currents come into play. This is particularly true near inlets, bars, river mouths, river bends, and areas where currents diverge or converge. Generally, there are four conditions encountered while towing in current:

- Head Current
- Tail Current
- Cross Current
- Combinations of the above

NOTE

Keep overall tow length in mind. In current, even though the towing vessel may be well clear of obstructions or buoys, the tow rig and towed vessel may be set into them.

To effectively deal with any of these, you must navigate not only the towing vessel, but the towed vessel as well. One way to do this is to look at a stern tow as a single long vessel, with the propeller(s) and rudder(s) at the bow, and the pivot point at the stern. Though not a totally accurate picture, it shows that just because the towing vessel (the bow) changes direction, the towed vessel (the stern) will not immediately and automatically follow. Momentum will try to keep the towed vessel going in the original direction. Also, though you may frequently "crab" against the current with the towing vessel alone, now you must crab a vessel that becomes longer than the towline.

"Local knowledge" becomes extremely important when dealing with current. The effect of current on vessel navigation at 12 - 30 knots is far less than the effect while towing at 6 - 8 knots.

D.41. Head current

This is a current flowing directly against the steered course. Depending on the velocity of the current and the speed of the tow, speed over the ground may be reduced, stopped, or even reversed.

CAUTION !

Regardless of speed over the ground, the tow is still moving through the water. Safe towing speed is based on speed through the water. Avoid towing a vessel above its hull speed nor exceed the safe limits imposed by wind and sea conditions. If the current opposes winds and seas, the seas get steeper and break more readily. Increasing the speed through the water places excessive strain on a tow rig and deck fittings. Dynamic forces are still at work.

D.41.a. Narrow and straight waterways

A head current in a "narrow" waterway poses other concerns. In a perfectly straight waterway, shallower water outside a deep channel will provide some relief, provided that the tow remains in deep enough water for safe navigation.

CAUTION !

Make sure that both the towing vessel and the tow stay in water deep enough so neither vessel grounds.

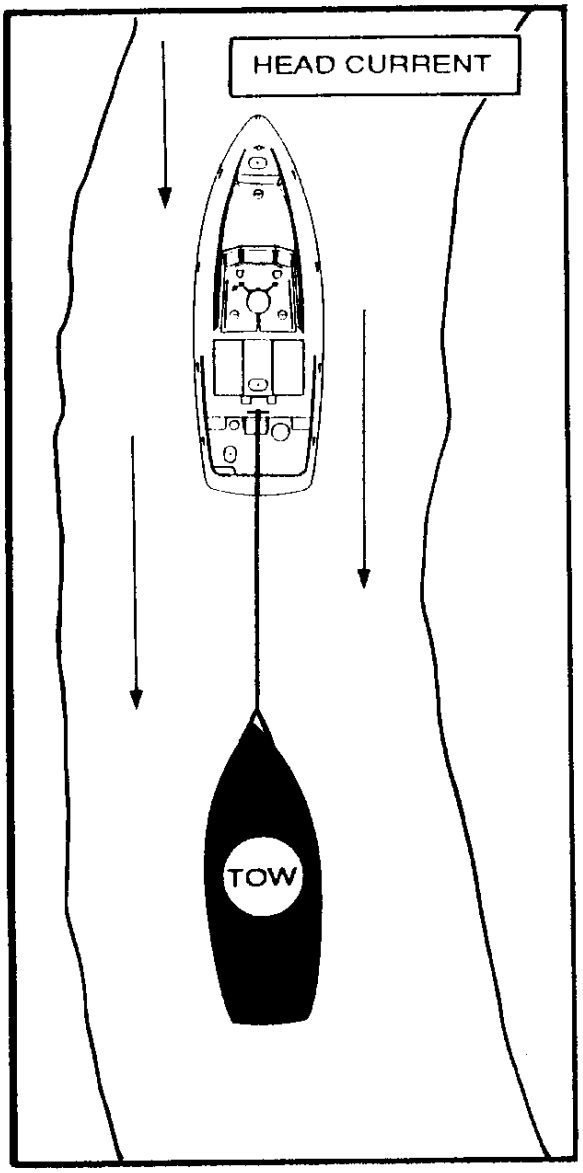
D.41.b. Bends and turns

When towing in a waterway with bends and turns, the greatest current will be to the outside of the bend or turn. Accordingly, the water will be deepest on the outside. When towing around a bend, the direction of the head current acting on the towing vessel may differ from that on the towed vessel. At a bend, the towed vessel may sheer (or yaw) to the outside of the bend.

NOTE

Prevent towed vessel sheer by reducing towline length before entering narrower sections of a waterway.

- To deal with an very strong head current, consider waiting for the current to slacken, waiting offshore for tidal conditions to change, or changing destination. Also, you may find an area out of the main current flow to make progress.
- Determine conditions in the river prior to entering. It may be prudent to remain in open water until currents slacken or tidal conditions change.



Effects of Head Current
Figure 17-16

D.42. Tail current This is a current flowing in the same direction as the course steered. Stay aware of how the influence of a tail current affects both vessels. As with the head current, in general, speed through the water indicates appropriate handling procedures, not speed over the ground.

D.42.a. Open water

In open water, a tail current usually helps the tow along. However, when opposing the wind or seas, the tail current causes steeper waves. The steeper waves may require slowing the towing speed. Account for the tail current when estimating the time of arrival. All course changes or shortening-up of the tow must be done earlier, or the current will carry the tow past the desired point. Then, considerable effort will be needed to go back against the (now) head current.

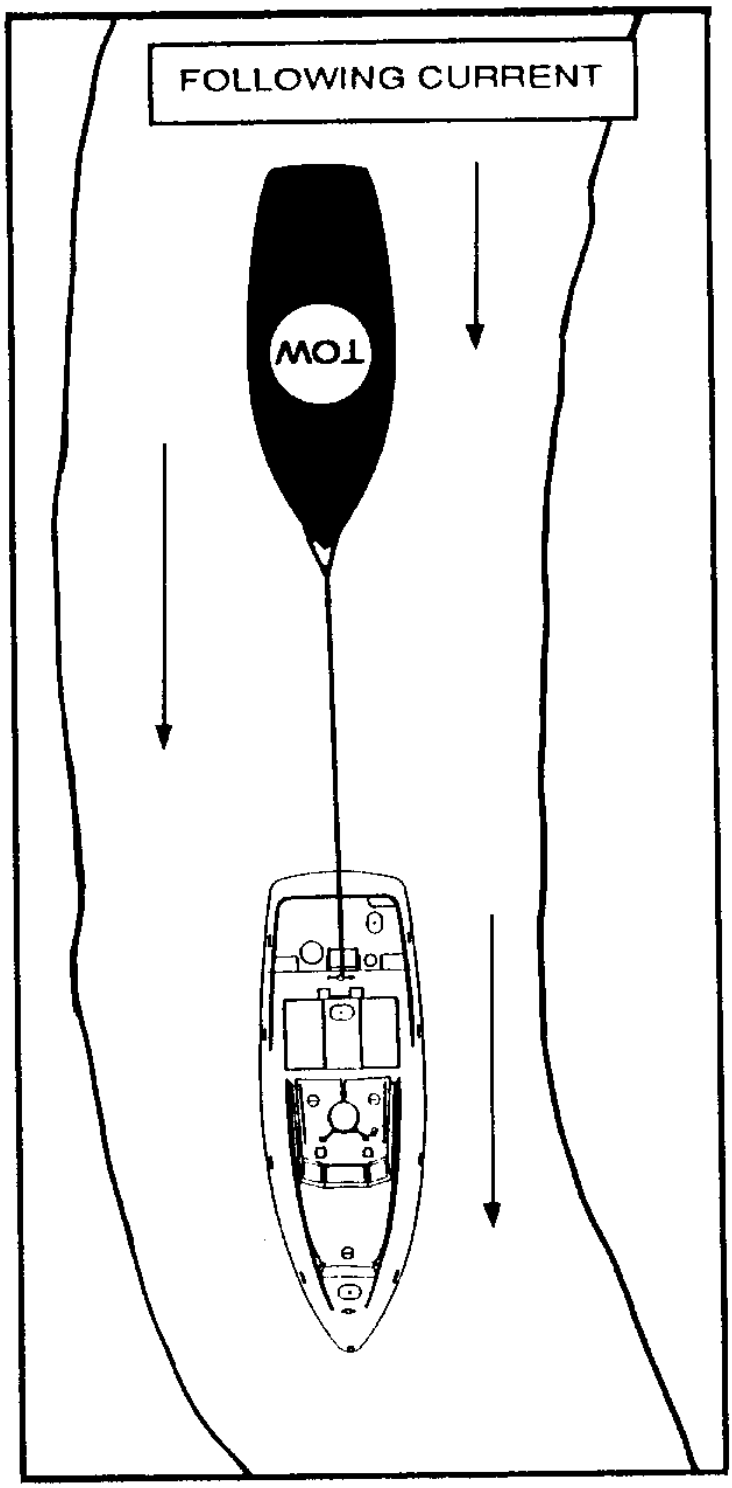
NOTE

Compensate for a tail current by taking early action.

D.42.b. Narrow waterway

As with a head current, a tail current in a narrow waterway also affects how the tow handles. A common situation develops when the towing vessel gets into an area of lesser current then the towed vessel. This often occurs near turns and bends where it appears that the shortest distance is on the inside of the bend. If there is a significant difference in the current, the tow sheers off along the axis of the current. This will possibly cause slack in the tow rig, loss of firm control, and will potentially overrun the towing vessel.

- Minimize the possibility of loss of control in a tail current by staying in the same velocity of current as the tow. As with a head current, one way to do this is by shortening scope of the towline.
- If a tail current looks as if it will become unmanageable, it may be necessary to change course and steer more into the current.



Effects of Tail (Following) Current
Figure 17-17

D.43. Cross current

This is a current that is flowing from either side, across the intended track. This current will require the towing vessel to adjust heading for set and drift for both vessels. At a towing speed of 7 knots, a 2-knot cross current will require a heading offset of over 15 degrees in order to follow the intended track. In open water, this may not pose a problem, if the towing vessel adjusts properly throughout the tow.

In restricted waters, suddenly encountering a cross-current, such as where a longshore current crosses a harbor entrance channel, could first cause the tow to appear to veer, even though the towing vessel is the one being affected. Then when the towed vessel encounters the flow, it will appear to veer the other way.

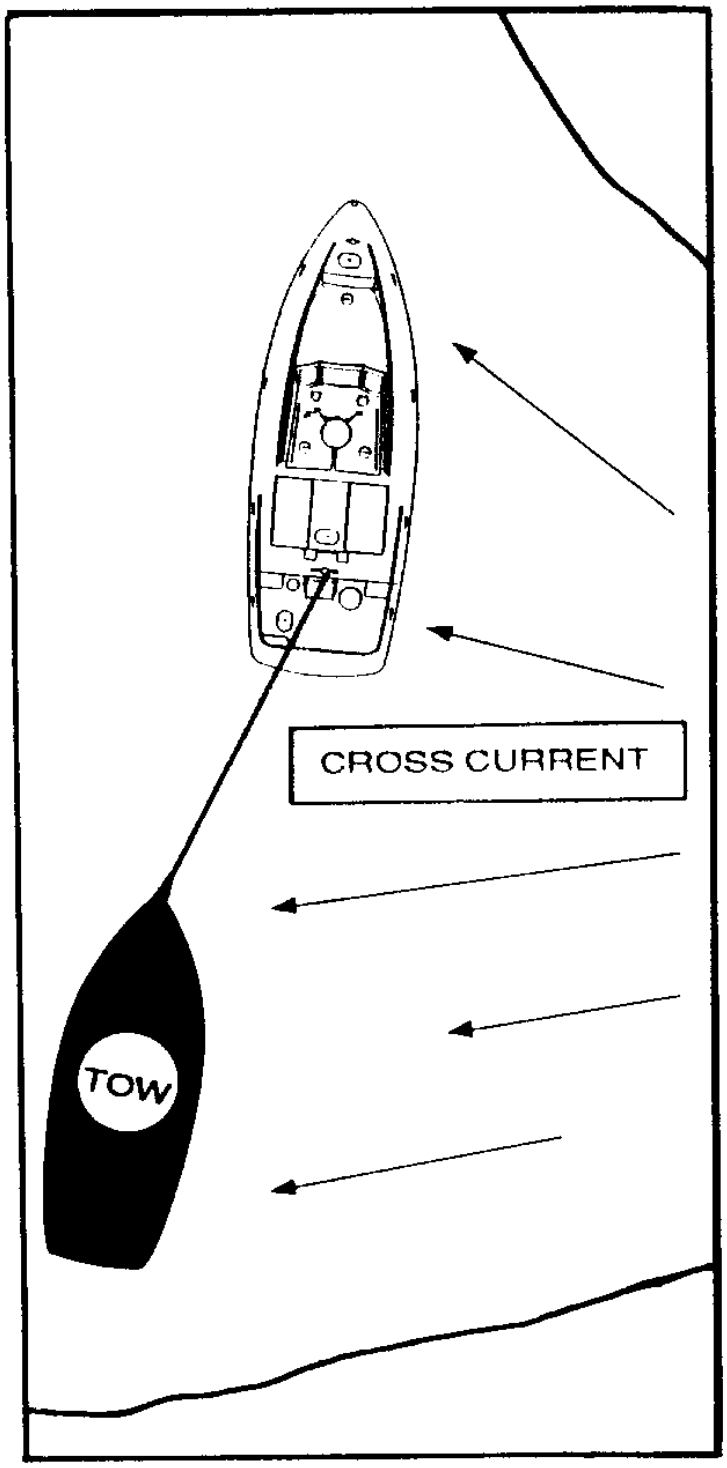
In restricted waters, the towing vessel must adjust accordingly for the amount the cross current offsets the towed vessel from the intended track. The cross current could push the towed vessel into danger.

- Minimize the possibility of a cross current pushing the towed vessel into danger through a combination of shortening tow and offsetting the towing vessel's intended track in an up-current direction.

As an example, if a cross-current moving from right to left is present near a channel entrance, shorten the tow before entering and line up the towing vessel to the right of the channel centerline. If unable to shorten tow, get well off to the up-current side of the channel centerline.

WARNING

While towing astern, if there is any cross-current in a channel marked by a navigational range, DO NOT steer the towing vessel exactly on the range. Doing so could stand the towed vessel into danger on the down-current side of the channel. If the towed vessel has any problems such as steering or stability, keep the towed vessel in good water (usually the center of the channel, marked by the range). Use the towed vessel's crew to inform you when on the range. Remember, when you take a vessel in tow, you become responsible for its safety.



Effects of Cross Current
Figure 17-18

D.44. Combinations of currents

Seldom will the current be dead on the bow, from directly astern, or exactly on the beam. If it happens to be that way at the moment, it may not be for very long. The marine environment is constantly changing, including the motion of currents. Combine the general principles and specific procedures discussed above to effectively compensate for combinations of currents.

Closely watch the surface of the water for evidence of current changes. A "tide line" usually appears at the leading edge of a current change or marks the difference between two different flows. A river's color changes because of flow from another river. "Tide-rips" or bar conditions vary with the amount of current.

NOTE

There is no substitute for experience and preparation. Learn your area of operations and be alert to hazards so you will not be taken by surprise.

Shortening the Tow

D.45. General

When approaching safe haven, it may be necessary to shorten the towline to safely enter an inlet, cross a bar, tow in a channel or turn into a basin. Shorten the tow to increase control in confined areas and in current. The towline must be slack to shorten tow. The coxswain controls the amount of slack and the direction the towline tends while the crew recovers the tow line. The crew and coxswain must communicate and coordinate their efforts and actions to make the task as easy as possible without fouling the tow vessel's propellers or rudders. Keep towline recovery on the beam or quarter to keep the slack towline from fouling the propellers.

D.46. Before shortening a tow

- Determine a safe area considering wind, depth of water, size of vessel, area to maneuver, etc.
- Determine the new desired towline length.
- Brief the towed vessel's crew.
- Brief own crew and assign tasks.
- Reduce speed slowly and gradually to prevent the tow from closing too fast, and risking collision. Due to momentum, a vessel with greater displacement will keep way on longer than a light displacement vessel. A vessel with way on will stop more quickly when turned into the wind and seas.
- As towline gets slack, direct crew to remove turns from the tow bitt. Crew member at the bitt pulls slack so as to be ready to take a turn if necessary.

D.47. Procedures

The following are procedures describing how to shorten the tow.

Step	Procedure
1	As pivot begins, the coxswain directs the bitt person to break the bitt and a line handler must begin to pull in the towline. Recover towline and take it up on the tow reel (if equipped). Do not let bights of towline litter the deck or the crew working area.
2	The coxswain backs as necessary to slack the line, which allows the line handler to haul in the line more easily.
3	If the wind is any angle off the bow, ensure the towing vessel is blown away from the towline.

Step	Procedure
4	If the severity of the weather hampers control of the towing vessel, shorten the tow in segments. If an attempt to shorten must be aborted, the coxswain directs the bitt person to take a working turn and remove any slack. The crew must clear out between the bitt and the towed vessel before there is strain at the bitt. Make up the bitt if needed to hold the strain. The coxswain must then maneuver and restart the procedure.

CAUTION !

Do not back too quickly and cause a large bight in the towline that increases risk of fouling propellers or rudders. Backing too quickly may also create too much strain for the line handler if the towline bight leads too far forward.

Once a short tow is set, the "shock absorber" effect of catenary and scope is reduced. Use special care to counteract shock loading.

D.48. At sea or in other rough conditions

Turn into the weather with seas or wind (whichever is greatest influence on tow vessel motion) 30 to 40 degrees off the bow. If a lot of towline must be recovered, put the towing vessel's bow directly into the seas. Whatever angle to the sea is chosen, pivot the towing vessel bow directly into the seas or wind whenever backing down to recover towline. Crew communication and boat handling skills are paramount in this situation to avoid fouling the towline in the towing vessel's propellers

The greatest control occurs when the wind and seas are off the towing vessel's bow while on the beam of the tow. The wind and seas will drift the tow away from the towline.

D.48.a. Towing speed

Reduce speed to lessen the forces on the towed vessel, which in turn are transferred to the towing vessel.

- In heavy weather, constantly adjust towing speed to prevent a tow from surfing on a wave or broaching.
- If a large wave approaches the stern of a tow, increase tow vessel speed to keep ahead of the tow as it is pushed by the swell.
- As a tow reaches the crest of a swell, reduce speed. Keep the towline taut. The coxswain must constantly watch the seas astern and the towed vessel until in sheltered waters.

- Deploy the drogue.

NOTE

This technique is very demanding and must be learned through training and experience. Throttle response (acceleration and deceleration) must be matched to the towed vessel's speed. If this technique is impractical to counteract shock-loading, speed reduction and quartering the seas may be your best options.

D.48.b. Calm conditions

In calm conditions, if not much towline was out to begin with, shortening a tow may not be necessary. It may be easier to go directly to an alongside tow.

D.49. Disconnect tow or tow alongside

At the safe haven, the towing vessel will either moor the towed vessel or disconnect the tow so the towed vessel can anchor or be assisted by other resources.

NOTE

If you decide to disconnect the tow, determine beforehand whether any other part of the rig will stay aboard the towed vessel. The weight of shackles or a wire-rope bridle will increase the difficulty of towline recovery, and could pose additional risk of fouling in propellers or rudders.

D.49.a. Disconnect the towline

The towline should be shortened up to some extent already. Turn the towed vessel into the prevailing conditions for better control. This procedure makes towline recovery easier and safer because there is less towline for the crew to recover and less towline in the water to foul propellers. It also allows the towing vessel to maintain control of a tow a little longer. Once shortened, and with the tow barely moving to allow the towline to slacken, the coxswain signals for the towed vessel crew to disconnect the rig and let it go into the water. The towing vessel crew then hauls it aboard.

Towing Alongside

D.50. General

When set up properly, an alongside tow allows two vessels to be maneuvered as one. This advantage is necessary when approaching a dock, mooring, or anchorage in sheltered waters, or when maneuvering in congested or restricted waters. Most of the pre-tow procedures used for towing astern described earlier in the chapter remain valid. However, some additional preparations are needed and the make-up of the tow rig and approach will be different. The tow rig configuration and approach will be more like that for mooring.

D.51. Preparation

These additional preparations apply for an alongside tow.

D.51.a. Determine side of tow and approach

Determine on which side the tow will be rigged. Note the effect of the weather and physical conditions on both vessels, and use them to your advantage. Although similar to a mooring approach, you must decide whether you want the wind to set the other vessel down on you, or vice-versa. Assess the other vessel's drift rate and aspect to plan the speed and angle of your approach.

- If a vessel smaller than the towing vessel is being rapidly set towards a lee shore or obstructions, consider approaching from leeward, if sea room allows.

WARNING

Do not place the towing vessel between a larger towed vessel and a lee shore or obstruction. The towing vessel may not be able to overcome the other vessel's momentum before losing all room to maneuver. As with any towing approach, leave an escape route.

D.51.b. Decide use of towline

If the alongside tow occurs at the completion of a stern tow, decide if the towline will be disconnected from the stern tow, or hauled in while still connected and used as a bow line for the alongside rig. If the stern tow required a bridle, disconnecting part of or all of the rig may be the only option to provide a fair lead for the alongside bow line.

CAUTION !

Use of a towline as the bow line in an alongside tow puts more line lying on deck and may be a tripping or fouling hazard.

D.51.c. Prepare lines	Ready the proper size and number of lines to rig alongside. Determine where the attachment points on the towed vessel will be for each line.
D.51.d. Determine hull match	Determine hull match. Assess how the two hulls will align alongside. In towing alongside, the tow vessel may be angled, slightly bow-in to the towed vessel, with the towing vessel propeller(s) and rudder(s) aft of the towed vessel's transom, rudder, or outdrive(s).
D.51.e. Rig fenders	Rig all available fenders, except one for hand tending as the tow approaches, in potential contact points. Secure all fenders in place before bringing a tow alongside. Secure fenders using clove hitches or slip clove hitches.
NOTE	Keep all lines clear of the water.
D.51.f. Brief towed vessel	• Advise which side to prepare. • If already in stern tow, describe shortening-up and whether towline will be used as bow line or whether (and when, "on signal") to cast off. • Describe your approach and intended position alongside. • Direct the towed vessel to clear as many obstructions from the side as possible (rigging, lines, outriggers, etc.). • Direct the towed vessel to place fenders at obvious areas, such as trawler doors or topside vents. • Designate attachment points. • Direct crew how to assist.
D.52. Make the approach	Two alternatives are presented. • Use towline as bow line • Free approach

D.52.a. Use towline as bow line

The towed vessel is already in a stern tow.

- Use the same methods as shortening the tow to take all headway off the tow before backing down. If the towed vessel has available propulsion, it may be able to assist by briefly backing down. If necessary, use the towline to change the heading of the towed vessel.
- When the tow has stopped all forward movement, the coxswain directs the crew to "break the bitt". The towing vessel slowly backs and the towline is hauled in. Try to keep some space abeam until the towed vessel is in the proper fore and aft position. As the distance between the vessels decreases and as directed by the coxswain, the crew walks the towline forward to a suitable bow fitting, takes a working turn on the line and takes in slack. The coxswain then moors the towing vessel alongside the towed vessel.

NOTE

Show the towed vessel crew where to attach the alongside mooring lines. Perform all line handling at coxswain direction, just as in mooring. Always pass the eye of alongside lines to a towed vessel. Keep the working ends of the lines aboard the towing vessel to adjust or relocate as necessary.

D.52.b. Free approach

Make this approach as if mooring to a pier, but the first line over will be the bow line. There will not be a spring line to check your forward motion with respect to the towed vessel. The coxswain directs the crew to pass the bow line when alongside.

WARNING

Do not fend of boat with your feet or hands.

D.53. Rig additional lines alongside

Once alongside, with the bow line connected, position the tow so that the towing vessel's propeller(s) and rudder(s) are well aft of the towed vessel's stern. This affords best control for maneuvering in confined areas. Check fender placement and make adjustments so they provide maximum protection at contact points.

D.53.a. Calm conditions

If there is little or no movement from wind, seas or current, rig lines in the following order:

- Second line: Rig a stern line from the towed vessel's towing bitt or post. This line holds the stern in while setting up the "spring lines".
- Third line: Rig a "tow strap" (forward spring line) from the towing vessel bow or forward mooring fitting to a point outboard and aft on the towed vessel.
- Fourth line: Rig a backing line (after spring line) from a quarter location on the towing vessel to a location forward on the towed vessel.

NOTE

For maximum control of a tow, all alongside lines should be as tight as possible. Spring lines are tightened by crew members taking up slack obtained when the coxswain throttles forward and reverse on the inside engine, pulling first against the tow strap then backing down against the backing line.

D.53.b. In wind, seas, or current

If conditions are setting the vessels into danger, i.e., toward shoals or breakwaters, and time is critical, follow this order:

- Second line: Rig a tow strap so that, once secured, the towing vessel can put headway on and move clear of any dangers.
- Third line: With headway still on, rig a backing line. You will need this to slow the towed vessel.
- Fourth line: The stern line.

D.54. Maneuvering

Maneuvering with an alongside tow is a challenging boat-handling technique. To do it well and do it safely requires practice and experience. An accomplished coxswain will observe how winds, seas and current affect the combined tow and use these forces to the best advantage, often making the maneuver look easier than it really was.

D.54.a. Approach for mooring

To moor an alongside tow safely and skillfully:

- Anticipate well ahead of time and decrease speed gradually
  - Place the larger vessel against the dock or mooring.
  - Making an approach into the wind and current if possible.
  - Moor on the protected (leeward) side of a dock or pier.

Place a crew member in good position as a lookout aboard a towed vessel on approach. This extends a coxswain's vision for clearances and obstructions. Rig fenders and mooring lines from the tow if it is going to be placed against a dock or mooring.

Sinking Tows

D.55. General

When it becomes evident that a tow is about to sink, very quickly assess the situation. Quick decisive action to minimize loss of life is the first priority. Once abandon ship procedures are initiated, radio communications will likely be lost. The primary action is to rescue the people, either from the deck of the towed vessel or from the water.

A sinking tow can pull the stern of the towing vessel under unless all crew members pay close attention to the immediate situation. There will probably not be enough time to disconnect the towline from the towed vessel once it begins to sink.

If a tow begins to sink, stop all towing vessel headway. The force exerted through the towline increases the danger of the towed vessel yawing and capsizing.

D.56. Minimize the danger

Perform the following procedures:

- When it becomes obvious that sinking cannot be avoided, e.g., the tow has rolled on one side and is not righting itself or the tow's decks are submerging, cut the towline or slip the towline by breaking the bitt.
- Note the vessel's position by GPS, Loran or radar fix and request assistance. Once free of the tow, make preparations to rescue people who were on board.

WARNING

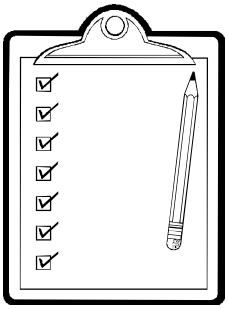
Do not attempt breaking the bitt if there is a strain on the towline. Instead, cut the towline using a knife. Cut towline directly behind the tow bitt.

CAUTION !

Be aware that the boat could become fouled in rigging or debris while attempting to rescue survivors.

D.57. Mark the wreck

If there were no people on board the tow, the water is shallow (depth less than towline length), and safety permits, pay out the towline until the tow reaches bottom. Tie a fender, life jacket or floatable object to the towline so it is visible on the surface, then cut the towline. The floating object will mark the location of the sunken vessel for salvage later.



Appendix 17-A
Towing Precautions

1. Maintain communications between coxswain and crew.

2. Have all people on board a distressed boat don PFDs. If there are not enough PFDs, provide them.

CAUTION !

Do not allow a distressed boat to become endangered while waiting for people to don PFDs. Take immediate action to remove the people or boat from danger.

3. Remove all people from a distressed boat when necessary, safe, or practical.

4. Cast heaving lines well over a boat's center mass so they drop over the deck. Tell people on board what is going to occur. Call out "HEADS UP" just before casting a heaving line.

5. Establish and maintain clear communications with a towed vessel, including a backup means of communicating. Provide a portable radio if necessary. At a minimum, contact a tow every 30 minutes and more frequently if conditions warrant. Initially, get the following information from the operator of the towed boat:

- condition of towline, chafing gear, towline attachment point, and fair lead hardware
- level of water on board/rate of flooding (if taking on water)
- physical condition of people on board.

6. When underway, keep personnel on board both boats clear of the tow rig.

7.	Keep the tow rig attachment point as low and close to the centerline as possible.
8.	Do not connect a tow rig to lifelines, stanchions, grab rails or ladders.
9.	Do not connect the tow rig to cleats or bitts which are attached to the distressed boat's deck only with screws.
10.	Avoid using lines provided by the distressed boat for any part of the tow rig.
11.	Avoid using knots to join towlines.
12.	Tend a towline by hand until secured to a distressed boat. Then, secure it to a bitt or cleat on the coxswain's command. Use two people, if possible, assigned as line handlers to tend the towline and a crew member to work the bitt.
13.	Do not secure a towline to a bitt or cleat with half hitches. They cause jamming and fusing.
14.	A crew member working the bitt or cleat must avoid crossing arms when securing the line to the bitt or cleat. Change hands to avoid becoming fouled in the turns.
15.	Ensure the breaking strength of all shackles used in the tow rig is equal to or greater than the breaking strength of the towline.
16.	Keep the towline clear of propellers, shafts and rudders.
17.	Use chafing gear to minimize damage to a tow rig.
18.	Avoid towing boats which exceed weight and length limits established for a Coast Guard boat.
19.	Tow at a safe speed for the prevailing conditions. Prevent shock loading the tow rig.

20. Do not exceed the hull design speed of the boat. Sailboats have a low hull speed design.

21. Avoid sudden maneuvers and sharp turns.

22. Use a drogue to reduce or prevent yawing (as necessary).

23. Have someone at the helm of the towed vessel, if possible. Direct that person to steer the boat directly on the stern of the towing boat. If all people have been removed from a distressed boat, secure the rudder amidships. If a tow has an outboard or inboard/outboard engine, direct the operator to lower the outdrive(s) or motor(s) to normal operating position.

24.

- Keep a towed boat in trim. Consider the following for trim:
- condition of a boat (structural damage, taking on water, etc.)
- structural design of a boat (low transom, low freeboard, etc.)
- cargo (fish holds, gear stowage, etc.) and how free surface effect (dynamics of free moving water in the bilge of a boat) influence ride
- number and location of people on board

WARNING

Overload astern, or along either side of a vessel's centerline, may swamp or capsize a vessel in tow.

25. Maintain a diligent towing watch and frequently account for all people on board the towed boat either visually or by radio.

NOTE

A towing watch has a critical responsibility. In addition to the crew member assigned, it is a collateral duty for all other members of a crew.

26. Ensure the breaking strengths of bridles in a tow rig are equal to or greater than the breaking strength of a towline or appropriately matched to the requirements of the tow and prevailing conditions.

27. If possible, load Loran or GPS positions and do all chart work at the dock. It is very difficult to do all of this while underway and being tossed about.

28.	If the possibility exists that a drogue or pump will be required while under tow, pass the equipment before the tow rig is hooked up.
29.	After a tow rig is set up, but before it is connected to a tow, a coxswain should inspect the entire tow rig and hookup points
30.	When approaching a distressed boat, a coxswain should establish an imaginary danger zone around the craft based on prevailing conditions.